N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

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Research Design

Contributors
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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental
Concepts Relevant to Research Design (1)

Causality

A → B
Pressure → Ulcer

Multicausality

Years smoking
High fat diet → Heart disease
Limited exercise
• Probability: Likelihood of an outcome
• Bias: Slanting findings
• Manipulation: Treatment
• Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- **Controlling the treatment**
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- Controlling extraneous variables
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

No

Is the primary purpose examination of relationships?

No

Descriptive Design

Yes

Quasi-Experimental Study

Will the sample be studied as a single group?

No

Correlational Design

Yes

Experimental Study

Will a randomly assigned control group be used?

No

Is the original sample randomly selected?

No

Yes
Selecting a Descriptive Design

Examining sequences across time?

- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Design

- Yes
  - Following same subjects across time?
    - No
      - Data collected across time
        - No
          - Cross-sectional design
        - Yes
          - Studying events partitioned across time?
            - No
              - Trend Analysis
            - Yes
              - Repeated measures of each subject
                - Yes
                  - Single unit of study
                - No
                  - Case Study

A Typical Descriptive Design

**Clarification** → **Measurement** → **Description** → **Interpretation**

- **Phenomenon of Interest**
  - Variable 1
  - Variable 2
  - Variable 3
  - Variable 4

- **Description of Variable 1**
- **Description of Variable 2**
- **Description of Variable 3**
- **Description of Variable 4**

**Interpretation of Meaning**

**Development of Hypotheses**
A Comparative Descriptive Design

Group I
{variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Group II
{variables measured}

Describe

Development of Hypotheses

Research Design
Selecting the Type of Correlational Design

- **Describe relationships between/among variables?**
  - Descriptive correlational design

- **Predict relationships between/among variables?**
  - Predictive correlational design

- **Test theoretically proposed Relationships?**
  - Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Description of variable

Development of Hypotheses

Research Variable 2
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

Control Group?

No

Pretest?

No

One-group post-test only design

Comparison with population values?

No

Repeated Measures?

No

Strategy for Comparison

No

Suggest Reevaluating design

No

One group pretest/post-test design

Yes

Pretest?

No

Repeated Measures?

No

Compare treatment & control conditions?

Yes

Research Design
Selecting The Type of Experimental Design

- Pretest
  - No
    - Post-test only control group design
  - Yes
    - Repeated Measurements?
      - No
        - Examine effects of confounding variables?
          - No
            - Multiple sites?
              - No
                - Pretest/post-test control group design
              - Yes
                - Randomized clinical trials
          - Yes
            - Blocking?
              - No
                - Comparison of multiple levels of treatment
              - Yes
                - Randomized Block Design
    - Yes
      - Repeated measures design
      - Examining of complex relationships among variables in relation to treatment

Research Design
### Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:**
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

**Example:** Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

**Uncontrolled threats to validity:**
- Testing
- Mortality

**Instrumentation:** Restricted generalizability as control increases
### Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Treatment (TREATMENT)</th>
<th>POST-TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected control group</td>
<td></td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

- **Measurement of independent variables**
- **Measurement of dependent variables**

<table>
<thead>
<tr>
<th><strong>Treatment:</strong></th>
<th>Under control of researcher</th>
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</thead>
<tbody>
<tr>
<td><strong>Findings:</strong></td>
<td>Comparison of experimental and control groups</td>
</tr>
<tr>
<td><strong>Uncontrolled threats to validity:</strong></td>
<td>Instrumentation, Mortality, Limited generalizability as control increases</td>
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</tbody>
</table>
### Nested Design

#### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>Unit A</th>
<th>Unit B</th>
<th>Unit C</th>
<th>Unit D</th>
<th>Unit E</th>
<th>Unit F</th>
<th>Unit G</th>
<th>Unit H</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRN Medication</td>
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<tr>
<td>New approach: “Around the clock” medication</td>
<td>Unit E</td>
<td>Unit F</td>
<td>Unit G</td>
<td>Unit H</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Primary Nursing Care</th>
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</thead>
<tbody>
<tr>
<td>Primary Care</td>
</tr>
<tr>
<td>No Primary Care</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit A</th>
<th>Unit B</th>
<th>Unit C</th>
<th>Unit D</th>
<th>Unit E</th>
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## Research Design
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design